IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TENNESSEE

JAMES T. MORRISON and
SHIRLEY J. MORRISON

Plaintiffs,

VS.

NO. 19-CV-00011
JURY DEMANDED

HARLEYSVILLE WORCESTER INSURANCE COMPANY,

Defendant.

DECLARATION OF EUGENIA MIRICA, Ph.D.

Comes now Eugenia Mirica, Ph.D., pursuant to 28 U.S.C. § 1746, and submits her declaration for use in the above styled lawsuit as follows:

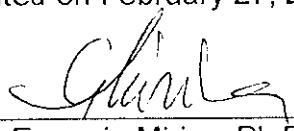
1. My name is Eugenia Mirica, Ph.D. I am over eighteen (18) years of age and have personal knowledge of the information contained within this Declaration.
2. I am the Material Science Laboratory Manager for EMSL Analytical, Inc. A copy of my resume describing my professional experience, education, technical skills and listing my publications is attached hereto as ***Exhibit A***.
3. Attached hereto as ***Exhibit B*** is a true, correct and authentic copy of a document entitled *Response to Report # 203-19/Microlab Northwest/To Brandon McWherter* authored by me and expressing my professional opinions concerning the matters described therein for use in the above litigation.
4. Attached hereto as ***Exhibit C*** is a true, correct and authentic copy of a document entitled *Response to commentary from Environmental Analysis Associates/To*

Brandon McWherter authored by me and expressing my professional opinions concerning the matters described therein for use in the above litigation.

OATH

I declare under penalty of perjury under the laws of the United States that that the forgoing statements are true and correct.

Executed on February 27, 2020.



Eugenia Mirica, Ph.D.

EUGENIA MIRICA, PH.D.

Material Science Laboratory Manager
Cinnaminson, New Jersey

PROFESSIONAL EXPERIENCE:

EMSL Analytical, Inc.
Material Science Laboratory Manager
Cinnaminson, New Jersey | 2010 – Present

The laboratory management position may be assigned various responsibilities depending on the role they serve within the laboratory. Lab and department managers will usually be responsible for technical decisions for the laboratory such as:

- Assuring all requirements for laboratory equipment and supplies are met
- Resolution of analytical problems
- Development and implementation of training programs for analytical specialists
- Providing sufficient oversight of laboratory operations
- Review and approval of analytical results for release

As a whole, laboratory management personnel are responsible for overall administration of laboratory operations. They ensure company policies are understood by all personnel, adequate supervision is provided to staff; work scheduling procedures adequately address customer needs, and are responsible for ensuring all customer complaints are resolved. They shall also approve all employee reviews and promotions, and provide regional or corporate management with information regarding laboratory budgeting issues (e.g., purchase of equipment and supplies, expenses for out-of-house training, staffing requirements). The laboratory management staff shall ensure adequate supervision is provided for the laboratory technical personnel.

They are responsible for designating qualified personnel (deputies) to assume specific, temporary management responsibilities normally assigned to the laboratory management staff in the event of absence.

Ultimately, laboratory management personnel are responsible for the data reported by the laboratory. She or approved designees review and approve the final customer reports for release to the customer. This responsibility includes the verification of the sample results which, include:

- Verification of sample number
- Correctness of sample result
- Check for typographical errors
- Completeness of chain of custody

Management personnel shall ensure any designees are fully capable of performing these reviews on their behalf.

Management personnel or a designee shall ensure Quality Assurance (QA) standards are established, understood and administered. She is ultimately responsible for ensuring the QA program is conscientiously implemented. She reviews the QA program with the regional manager or national director to ensure completeness and effectiveness, and supports the local quality representatives, regional manager and/or the National QA Department in carrying out the program by use of authority. Laboratory management is ultimately responsible for ensuring Quality Control (QC) reports are submitted to the National QA Department in accordance with these QA program requirements.

EMSL Analytical, Inc.
Project/Client Services Laboratory Manager/Material Science Division
Westmont, New Jersey | 2002 – 2010

EDUCATION:

Stevens Institue of Technology | 2002
Ph.D. - Materials Science

Polytechnic Institute | 1991
Master of Science, Materials Science and Technology of Silicates and Oxides

Polytechnic Institute | 1991
Bachelor of Science, Materials Science and Technology of Silicates and Oxides

PUBLICATIONS:

Eugenia Mirica, "Scanning Electron Microscopy in Microanalytical Applications" Indoor Environment Connections, Volume 10, Issue 6, p.19 (2009)

Eugenia Mirica, John Newton, "Using Particle Identification Analysis for Indoor Air Quality Investigations" Indoor Environment Connections, Volume 10, Issue 1, p.26 (2009)
Eugenia Mirica, "Black Carbon, Carbon Black, Soot, Wildfires....Are they connected?" Indoor Environment Connections, Volume 9, Issue 10, p.33 (2008)

Eugenia Mirica, Glen Kowach, Paul Evans and Henry Du, "Morphological Evolution of ZnO Thin Films Deposited by Reactive Sputtering", Crystal Growth & Design, Vol. 4, No. 1, p. 147, (2004).

Eugenia Mirica, Glen Kowach and Henry Du, "A Modified Structure Zone Model to Describe the Morphological Evolution of ZnO Thin Films Deposited by Reactive Sputtering", Crystal Growth & Design, Vol. 4, No. 1, p. 157, (2004).

Glen Kowach, Eugenia Mirica, C.D.W. Jones, B.S. Dennis, A. Pinczuk, H. Safar, R.N. Kleiman and G. W. Kammlott, "Properties of Radio Frequency (RF) Sputtered Zinc Oxide Thin Films for Piezoelectric Applications", Technical Memorandum 11175-990923-19TM, Lucent Technologies-Bell Labs Innovations, (1999).

R. Brenier, J. Mugnier, and Eugenia Mirica. "XPS Study of the Thermal Evolution of Amorphous Zirconium Oxide Films Prepared by Sol-Gel", Applied Surface Physics, Vol. 134, 1-4 Apr., p. 85. (1999).

Lucia Gagea, Eugenia Mirica, and Laura Tautan. "Ceramic Composites for Technical Articles with Defined Shapes", Annual Conference of Scientific Research – Symposium Proceedings, Oradea (1997)

Liviu Literat, Lucia Gagea and Eugenia Mirica, "Ceramic Composites for Dental Implants", Academic Days – Symposium Proceedings, Timisoara (1997).

Lucia Gagea, Eugenia Mirica, and Alina Nistor, "Studies of Hydroxy-Apatite Biocompatibility with Living Body", Annual Conference of Scientific Research – Symposium Proceedings, Oradea (1996).

EXHIBIT
tabbies
A

Stevens Insitute of Technology Analytical, Inc.
Post-Doctoral Researcher
Hoboken, New Jersey | 2002

EPCOS Inc.
Surface Acoustic Wave Design Engineer
Iseline, New Jersey | 2002

Stevens Institue of Technology
Graduate Assistant - Materials Science and Engineering
Hoboken, New Jersey | 1998 – 2002

Lucent Technologies, Bell Labs
Summer Internship
Murray Hill, New Jersey | 1999 – 2000

Babes-Bolyai University
Assistant Professor
Cluj-Napoca, Romania | 1991 – 1998

Liviu Literat, Eugenia Mirica, and Janina Tipan, "Alternative Procedure for Granulometric Analysis of Powdery Dispersions", Civil Materials Revue, XXV No. 2, p. 132, (1995).

Lucia Gagea, Eugenia Mirica, Ceramic Pigments in ZrO2-SiO2 System", Civil Materials Revue, XXV, No. 4, (1995).

Liviu Literat and Eugenia Mirica, "The Properties of Barium Titanates Thin Films Processed with Sol-Gel Method", Modern Science and Technology – Symposium Proceedings, Technical University, Cluj-Napoca, September, p. 39 (1993).

L. Gagea, Eugenia Mirica, "Study of Behavior of Opacifiers and Pigments in Sanitary Porcelain", Civil Materials Revue, XXVI, Vol. 2 (1993).

Teoreanu, Eugenia Mirica, "The Influence of WO3 in the Synthesis of Barium Titanates with high TiO2 Content", Symposium of 20 years of Chemical Engineering Education, Cluj-Napoca (1991).

TECHNICAL SKILLS:

Scanning Electron Microscopy/Energy Dispersive X-ray Analysis

Transmission Electron Microscopy

Light Microscopy

X-ray Diffractometry

X-ray Flourescence

Fourier Transform Infrared Spectroscopy

Forensic Analysis

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February 25, 2020

Response to Report # 203-19/Microlab Northwest/To Brandon McWherter

Prepared for Mark Kinsman | Attorney at Law
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This is the response to the commentary report received on 11/8/19 regarding analysis provided by EMSL Analytical for GHP Environmental Architecture (EMSL project 361802112).

The comments of the review revolve around sampling methodology. The reviewer alleges that "alcohol wipe samples are not acceptable as a wildfire debris collection technique and that "standard method of choice for sampling or cleaning particles from a surface is the application of an adhesive film which is then peeled from the surface".

As indicated in the following standards and technical guide below, there are multiple options for collecting particles from surfaces depending on scope and analytical procedures:

- ASTM D6602-13- "Standard Practice for Sampling and Testing of Possible Carbon Black Fugitive Emissions or Other Environmental Particulate, or Both"
- ASTM D6966-13-"Standard Practice for Collection of Settled Dust Samples Using Wipe Sampling Methods for Subsequent Determination of Metals
- ASTM E1792-16-"Standard Specification for Wipe Sampling Materials for Lead in Surface Dust"
- ASTM D6480-10:-"Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Concentration by Transmission Electron Microscopy"
- ASTM D7144-16- "Standard Practice for Collection of Surface Dust by Micro-vacuum Sampling for Subsequent Metals Determination"
- ASTM D5755-14- " Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading"
- ASTM E1216-16-"Standard Practice for Sampling for Particulate Contamination by Tape Lift"
- ASTMD7910-14-"Standard Practice for Collection of Fungal Material from Surfaces by Tape Lift"
- AIHA Technical Guide for Wildfire Impact Investigations for the OEHS Professional

Therefore, the most common sampling options are:

- Micro-vacuuming
- Tape lifting
- Wet or dry wiping

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Analysis of combustion by-products (wildfires residues included) cannot be simplified into a single sampling technique or analytical procedure. Due to the wide range of particle sizes, the diversity of the sampling surfaces at the location and the various interferences encountered during the analytical procedures, each sampling method exhibits benefits and limitations that need to be taken into consideration when planning the course of the investigation.

Micro-vacuuming sampling option:

Advantages:

- Efficient sampling method for collecting particles from porous and uneven surfaces with medium and heavy loading;
- The samples represent the bulk amount of particle material, often of many different sizes;
- A variety of optical and electron microscopy methods can be used in the identification analysis of fire residues;
- The TEM confirmatory identification of aciniform soot, as indicated in ASTM D6602-13, can be applied using the drop-mount technique.

Disadvantages:

- Poor efficiency for collecting particles from relatively smooth non-porous surfaces with low loading;
- May induce damage to brittle particles such as char and ash; the damage can be greatly minimized if proper sampling procedures are applied. No damage is expected during sample preparation for analysis if following the procedures described in EMSL internal Standard Operating Procedure (SOP) for this analysis is: "MS Combustion By-Products and Fire Debris"-R0 2015.04.10.

Tape lifting sampling option:

Advantages:

- Efficient sampling method for collecting particles from relatively smooth non-porous surfaces with typical monolayer loading;
- It preserves the relative position of the particles on the original surface and the population per unit area; this is of interest when the agglomerate size and the distribution over the collection surface are important parameters for the investigation;
- A variety of optical microscopy methods can be used in the identification analysis, with minimal preparation.

Disadvantages:

- Poor efficiency for collecting on porous, uneven or heavily loaded surfaces, showing preferential sampling from the top layer particles;
- Application of overpressure during sampling may obscure or damage the brittle particles of char and ash;
- Limited sampling area (the area of the tape lift);
- Fine particles and particle agglomerates may be "adsorbed" into the adhesive greatly hindering the identification analysis by all the applicable methods and parameters;
- Particles cannot be dispersed hindering identification of individual grains from agglomerations;
- If the particles collected on the tape are relatively large, the mounting procedures for PLM analysis cannot be applied without breaking apart the particles to allow a proper positioning

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of the cover slip; The possible particle damage is not necessarily expected to devoid the particles of the main characteristics necessary for particle identification;

- The TEM confirmatory identification of aciniform soot cannot be applied.

Wipe sampling option (wet wipe):

Advantages:

- Efficient sampling method for collecting particles from relatively smooth non-porous surfaces with low medium, or heavy loading;
- A variety of optical and electron microscopy methods can be used in the identification analysis;
- The TEM confirmatory identification of aciniform soot, as indicated in ASTM D6602-13 can be applied using the drop-mount technique;
- Particle dispersion techniques for breaking up the agglomerates may enable more accurate identification of individual grains, necessary when environmental interferences are suspected.

Disadvantages:

- Poor efficiency for collecting on porous and uneven surfaces;
- Application of overpressure during sampling may obscure or damage the brittle particles of char and ash;
- May induce damage to brittle particles such as char and ash; the damage can be greatly minimized if proper sampling procedures are applied. Minimal damage is expected during sample preparation for analysis if following the procedures described in EMSL internal Standard Operating Procedure (SOP) for this analysis is: "MS Combustion By-Products and Fire Debris"-R0 2015.04.10. The possible particle damage is not necessarily expected to devoid the particles of the main fingerprinting analytical parameters that allow particle identification.

No water is used at any stage of the sample preparation and analysis performed by EMSL Analytical, Inc. The details of the sample preparation procedures and analytical techniques are described in EMSL internal Standard Operating Procedure (SOP); the SOP is subjected to A2LA periodic review during the re-accreditation audits. Typical reports for this analysis does not include details of such procedures, however they may be provided upon request. This reporting practice is common for many laboratories involved in analysis of wildfires debris and other types of analytical reporting.

The internal EMSL procedures for this testing have been devised based on information provided in ASTM D6602-13, McCrone-The Particles Atlas, and current scientific publications (such as Journal of Aerosol Science- Special Issue for the 9th International Conference on Carbonaceous Particles in the Atmosphere). The laboratory analysis relies on identification of the target analytes using light microscopy [Polarized Light Microscopy-PLM, Reflected Light Microscopy-RLM, and Stereo Microscopy-SM] and Electron Microscopy [Transmission Electron Microscopy/Energy Dispersive X-rays (TEM/EDX)], by determining the presence of the microscopic fingerprinting characteristics of target particles (char, ash, and soot). The procedures do not induce interferences with cigarette smoking (tobacco ash has specific morphological characteristics and the information is transmitted during the training procedures; presence of nicotine is confirmed by gas chromatography procedures, when of interest). The confirmatory analysis of black carbon/soot is performed by TEM/EDX, the methodology indicated in

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ASTM D6602-13 for aciniform structures. This method is the most advanced for complete identification of this parameter.

The wiper fibers originating from the wipe media is not considered part of the sample and not included when deriving the concentrations of the analytes of interest; hence no particle dilution factor was induced during the analysis.

The comments presented in the Commentary Report #203-19/Microlab Northwest do not present an objective assessment of the complexity of the options available for analysis of wildfires debris. The comments seem to be based on analytical preferences of the reviewer.

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February 25, 2020

Response to commentary from Environmental Analysis Associates/To Brandon McWherter

Prepared for Mark Kinsman | Attorney at Law
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This is the response to the commentary report received on 11/8/19 regarding analysis provided by EMSL Analytical for GHP Environmental Architecture (EMSL project 361802112).

The technical comments of the review start at section 2.0 "OPINIONS ON THE SAMPLING METHIOD USED BY GHP". The reviewer alleges that "wipe sampling procedure.....does not conform to recent AIHA or IESO guidelines and ignores the significant sample alteration described above that makes this sampling protocol inherently unreliable".

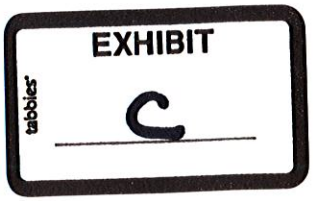
As indicated in the standards and in the AIHA technical guide enumerated below, there are multiple options for collecting particles from surfaces depending on scope and analytical procedures:

- ASTM D6602-13- "Standard Practice for Sampling and Testing of Possible Carbon Black Fugitive Emissions or Other Environmental Particulate, or Both"
- ASTM D6480-10:-"Standard Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Concentration by Transmission Electron Microscopy"
- ASTM D5755-14- "Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading"
- ASTM E1216-16-"Standard Practice for Sampling for Particulate Contamination by Tape Lift"
- ASTMD7910-14-"Standard Practice for Collection of Fungal Material from Surfaces by Tape Lift"
- AIHA Technical Guide for Wildfire Impact Investigations for the OEHS Professional

Therefore, the most common sampling options are:

- Micro-vacuuming
- Tape lifting
- Wet or dry wiping

As indicated in the "AIHA Technical Guide for Wildfire Impact Investigations for the OEHS Professional", also cited in the commentary from Environmental Analysis Associates, the analysis of wildfires residues cannot be simplified into a single sampling technique or analytical procedure. Due to the wide range of particle sizes, the diversity of the sampling surfaces at the location and the various interferences encountered during the analytical procedures, each sampling method exhibits benefits and limitations that need to be taken into consideration when planning the course of the investigation.



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Each of the sampling methodologies above display both advantages and disadvantages. Since the commentary focuses in contrasting the wipes and adhesive tape lifts sampling techniques, below are listed the main characteristics of the two.

Tape lifting sampling option:

Advantages:

- Efficient sampling method for collecting particles from relatively smooth non-porous surfaces with typical monolayer loading;
- It preserves the relative position of the particles on the original surface and the population per unit area; this is of interest when the agglomerate size and the distribution over the collection surface are important parameters for the investigation;
- A variety of optical microscopy methods can be used in the identification analysis, with minimal preparation.

Disadvantages:

- Poor efficiency for collecting on porous, uneven or heavily loaded surfaces, showing preferential sampling from the top layer particles; this introduces bias toward sampling particles from the most recent particle deposition event;
- Application of overpressure during sampling may obscure or damage the brittle particles of char and ash;
- Limited sampling area (the area of the tape lift);
- Fine particles and particle agglomerates may be "adsorbed" into the adhesive greatly hindering the identification analysis by all the applicable methods and for all the parameters;
- Particles cannot be dispersed hindering identification of individual grains from agglomerations;
- If the particles collected on the tape are relatively large, the mounting procedures for PLM analysis cannot be applied without breaking apart the particles to allow a proper positioning of the cover slip; The possible particle damage is not necessarily expected to devoid the particles of the main characteristics necessary for particle identification;
- The TEM confirmatory identification of aciniform soot cannot be applied (Note: aciniform means shaped like a cluster of grapes).

Wipe sampling option (wet wipe):

Advantages:

- Efficient sampling method for collecting particles from relatively smooth non-porous surfaces with low, medium, or heavy loading;
- A variety of optical and electron microscopy methods can be used in the identification analysis;
- The TEM confirmatory identification of aciniform soot, as indicated in ASTM D6602-13 can be applied using the drop-mount technique;
- Particle dispersion techniques for breaking up the agglomerates may enable more accurate identification of individual grains, necessary when environmental interferences are suspected.

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Disadvantages:

- Poor efficiency for collecting on porous and uneven surfaces;
- Application of overpressure during sampling may obscure or damage the brittle particles of char and ash;
- May induce damage to brittle particles such as char and ash; the damage can be greatly minimized if proper sampling procedures are applied. Minimal damage is expected during sample preparation for analysis if following the procedures described in EMSL internal Standard Operating Procedure (SOP) for this analysis is: "MS Combustion By-Products and Fire Debris"-R0 2015.04.10. The possible particle damage is not necessarily expected to devoid the particles of the main fingerprinting analytical parameters that allow particle identification.

EMSL Analytical offers testing for fire residues collected on all three sampling media indicated in the paragraphs above (adhesive tape lifts, micro vacuums and wet wipes) and also on bulk samples.

In section 3.0. "OPINIONS REGARDING THE EMSL SAMPLE PREPARATION AND WILDFIRE RESIDIE ANALYSES", the author of the commentary is indicating: "EMSL failed to provide an industry Standard Operating Procedure for any of their analysis procedures".

The details of sample preparation procedures and analytical techniques employed in the analysis are described in EMSL internal Standard Operating Procedure (MS-SOP-602-1/"Combustion-by-products and Fire Debris"). The SOP has been devised based on information provided in ASTM D6602-13, McCrone-The Particles Atlas, and current scientific publications (such as Journal of Aerosol Science- Special Issue for the 9th International Conference on Carbonaceous Particles in the Atmosphere). The content of the SOP is subjected to the A2LA accrediting agency periodic reviews during the biennial re-accreditation audits for this particular method (A2LA accreditation Certificate Number 2845.01, current). Typical reporting for this analysis does not include details of the analytical procedures, however they may be provided by request as a separate document. This reporting practice is common for many laboratories involved in analysis of wildfires debris and other types of analytical reporting.

As indicated in the analytical report EMSL project 361802112, the analysis performed at EMSL Analytical, Inc. involves the use of a multitude of microscopy techniques (both light and electron microscopy); this approach provides the ability to obtain an array of fingerprinting parameters for the target analytes.

These were the methods used during the analysis:

- Stereomicroscopy
- epi-Reflected Light Microscopy (RLM)
- Polarized Light Microscopy (PLM)
- Scanning Electron Microscopy (SEM)
- Energy-dispersive X-Ray Spectrometry (EDX)
- Transmission Electron Microscopy (TEM)

During the analysis by RLM and Stereomicroscopy, the sample was analyzed to observe the characteristics of the particles such as color, size, morphology and evidence of cellular morphology associated with vegetative fire residue.

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During the analysis by PLM, the samples were observed in both transmitted (direct and crossed polar) and reflected light to observe the characteristics of the particles including pleochroism, birefringence, sign of elongation, crystalline or amorphous structure, habit and refractive index (if needed). These methods were used to determine the presence of wildfire residue along with other particles typically found in environmental dust (fibrous particulate such as fibrous glass, cellulosic and synthetic materials, quartz, calcite, biological particles such as mold, pollen, skin fragments, etc.)

Scanning Electron Microscopy/Energy Dispersive X-rays (SEM/EDX) analysis was employed to aid the confirmation of the presence of fine char and ash particles and also for identifying minerals, rust/corrosion products, rubber dust, Portland cement. During the analysis, characteristics of the particles such as the morphology, agglomeration tendency, grain size, and the elemental composition were observed.

Transmission Electron Microscopy/EDX methodology was applied after light microscopy analysis; this is the mandatory method for the evaluation of the aciniform material present in the samples (black carbon/soot) to determine the size of the particles (expected 10-500 nm), and also if the morphology is consistent with the expected structure, as indicated in ASTM D6602-13.

Paragraph 4 of section 3.0 of the review from Environmental Analysis Associates includes this comment: "fire related soot particles can be semi-volatile and evaporate under high energy beam". The comment does not have a scientific basis and seems to indicate a misconception about the chemical identifiction of black carbon/soot, material obtained from incomplete combustion of hydrocarbon components; this material is different than carbon black, the industrial product. According to ASTM D6602-13, black carbon/soot is "a submicron black powder generally produced as an unwanted by-product of combustion or pyrolysis. It consists of various quantities of carbonaceous and inorganic solids in conjunction with adsorbed and occluded organic tars and resins." As indicated in the standard, black carbon/soot is mainly identified based on the size range and aciniform morphology. There is no scientific study showing that "evaporation" of "occluded tars" and "resins", when present, change the fingerprinting morphology of black carbon/soot. Moreover, if the "evaporation" indeed happens as the author of the commentary alleges, it would also take place under the influence of the electron beam when using Scanning Electron Microscopy/SEM, the method presented by the author in Paragraph 4 of section 3.0 as a better analytical alternative. The size range of the black carbon/soot particles is below the resolution limit of SEM instrumentation; the SEM image showing the agglomeration of soot in Figure 5 of the commentary can only be used as presumptive analysis since the most distinctive morphology of the soot particles cannot be distinguished. This is the reason why ASTM D6602-13 calls SEM methodology as "ancillary" for characterization of aciniform particles, where TEM is designated as the mandatory method.

Paragraph 7 of section 3.0 provides the author's opinions regarding the differences between Optical and Electron microscopy because "EMSL has totally failed to explain how they use the electron microscopy method within their own report". As indicated previously, the details of the analytical techniques employed in the analysis are described in EMSL internal Standard Operating Procedure (MS-SOP-602-1/"Combustion-by-products and Fire Debris"), available by request as separate document.

Section 7.b describes the author's opinion regarding the inappropriate use of Scanning Electron Microscopy as a "tool for the quantification of fire residues".

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There are several options to derive concentrations of fire residues when collected from surfaces:

1. Particle Count:
   - Results reported as [# of particles per surface area or % number]
   - The method does not take into consideration the size of the particle (10 µm size particle has the same count as a particle 1000 times bigger)
   - The method cannot be accurately applied when particles overlap or when they are agglomerated
2. Point Count:
   - Results reported as [# of particles per surface area or % number]
   - The method does take into consideration the size of the particle based on grid count
   - The method cannot be applied accurately applied when particles overlap or when they are agglomerated
3. Visual Area Estimation (VAE)

As clearly indicated in the report, the concentrations presented in EMSL project 361802112 were determined by the VAE method.

This technique is presented in EPA/600/R-93/116; the method estimates the relative projected area of a certain type of particulate from a mixture of particulate, by comparison to data derived from analysis of calibration materials having similar texture and particulate content. The method is widely used for the determination of asbestos in bulk building material and it takes into consideration all the solid components of the prepared sample.

Optical microscopy was the main technique used to derive the final concentrations reported in EMSL project 361802112. The concentrations of target analytes are initially estimated during the first stage of the light microscopy analysis. If black carbon/soot was detected during the presumptive light microscopy analysis, a ratio between the aciniform soot and the rest of components in the TEM preparation was derived during the confirmation analysis. This ratio was then introduced to derive the concentrations of analytes during the final stage of the light microscopy analysis.

The Limit of Quantitation (LOQ) of the VAE method is 1%. LOQ is defined as the minimum concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions. By comparison, Limit of Detection (LOD) is the minimum concentration that can be theoretically achieved for a given analytical procedure in the absence of matrix or sample processing effects. Particle analysis is limited to a single occurrence of an analyte particle in the sub-sample analyzed.

To date, there are no recognized standards that mandate the use of a certain type of concentration reporting format for wildfires residues. Commercial laboratories involved in this testing provide reporting based on internal procedures using the options commonly available for particle analysis using microscopy methods.

Section 4.0 "ANALYSIS METHODS USED BY ENVIRONMENTAL ANALYSIS ON THIS PROJECT" indicates that "Environmental Analysis Associates provided the analysis of tape-lift samples collected by Alliance Environmental Consulting on this project". Since EMSL Analytical has not been provided with the report produced by Environmental Analysis Associates for comments, it is unclear how the two projects relate in terms of analytical approach and reporting. The commentary indicates that the methods used for

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analysis by Environmental Analysis Associates were based on light microscopy alone, suggesting a narrower scope of testing.

At section 5-"CONCLUSION" paragraph 4, the author indicates "EMSL.....to arrive at the conclusion of "non detected" for a majority samples analyzed for GHP". In actuality, from 25 samples submitted to the analysis, EMSL project 361802112 reports char found at concentration <1% for 22 samples and Non Detected/ND for only 3 samples (88% of the samples had char <1 %). Hence, the conclusion is incorrect as written in the commentary. As indicated above, 1% is also the LOQ for the quantification method used in the analysis. The determination regarding what level of a selected analyte can be considered contamination from an investigated event is usually made by the site investigator based on factors related to the examination of the site at time of sampling, history of the site, and the details of the event itself.

It is therefore concluded that the opinions presented in the commentary report from Environmental Analysis Associates do not present an objective assessment of the complexity of the options available for analysis of wildfires debris. The comments seem to be based on the analytical preferences of the reviewer and selected information from the AIHA Technical Guide for Wildfire Impact Investigations for the OEHS Professional, in which the reviewer authored the electron microscopy section.

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